WHAT IS CLAIMED IS:

1. A pulse oximeter comprising:

a sensor configured to detect first and second electromagnetic radiation signals from a patient corresponding to first and second wavelengths of light;

an analog to digital converter, coupled to said sensor, for converting said first and second electromagnetic radiation signals into first and second digital signals; and

a processor, coupled to said analog to digital converter, said processor being programmed with

a filter module for filtering said first and second digital signals,

a first oxygen saturation calculation module for determining a first oxygen saturation value using a first saturation calculation algorithm applied to said first and second digital signals,

a second oxygen saturation calculation module for determining a second oxygen saturation value using a second saturation calculation algorithm applied to said first and second digital signals, and

an arbitration module for arbitrating by said pulse oximeter between said first and second oxygen saturation values based on a saturation confidence associated with said first and second oxygen saturation values to select a best oxygen saturation value.

2. The oximeter of claim 1 wherein said second saturation calculation algorithm utilizes the ratio of ratios.

3. The oximeter of claim 1 wherein said saturation confidence is based on noise characteristics of said first and second digital signals.

4. The oximeter of claim 1 wherein said wavelengths are red and infrared.

5. A pulse oximeter comprising:

a sensor configured to detect first and second electromagnetic radiation signals from a patient corresponding to first and second wavelengths of light;

an analog to digital converter, coupled to said sensor, for converting said first and second electromagnetic radiation signals into first and second digital signals; and

a processor, coupled to said analog to digital converter, said processor being programmed with

a filter module for filtering said first and second digital signals,

a normalization module for normalizing said first and second digital signals;

a first oxygen saturation calculation module for determining a first oxygen saturation value using a first saturation calculation algorithm applied to said first and second digital signals,

a second oxygen saturation calculation module for determining a second oxygen saturation value using a second saturation calculation algorithm applied to said first and second digital signals,

a best saturation module for arbitrating between said first and second oxygen saturation values based on a saturation confidence associated with said first and second oxygen saturation values to select a best oxygen saturation value,

a first pulse rate calculation module for determining a first pulse rate from said first and second digital signals using a first pulse rate algorithm,

a second pulse rate calculation module for determining a second pulse rate from said first and second digital signals using a second pulse rate algorithm, and

a best rate module for arbitrating between said first and second pulse rates based on a pulse rate confidence associated with said first and second pulse rate signals to select a best pulse rate.

6. The oximeter of claim 5 wherein said first saturation calculation algorithm is configured to perform adaptive filtering.

7. The oximeter of claim 5 wherein said second saturation calculation algorithm is configured to utilize the ratio of ratios.

8. The oximeter of claim 5 wherein said first pulse rate algorithm is configured to analyze a waveform of said first and second digital signals.

9. The oximeter of claim 8 wherein said second pulse rate algorithm is configured to analyze a frequency of said first and second digital signals.

10. The oximeter of claim 9 wherein said second pulse rate algorithm includes a comb filter.

11. The oximeter of claim 5 wherein said saturation confidence and said pulse rate confidence are based on noise characteristics of said first and second digital signals.

12. The oximeter of claim 5 further comprising:

wherein said program is configured to provide a first confidence level associated with said first oxygen saturation value, and a second confidence level associated with said second oxygen saturation value;

wherein the best saturation module is configured to compare the first and second confidence levels, and select as the best oxygen saturation value one associated with one of the first and second confidence levels which is greater than the other of the first and second confidence levels by at least a first amount.

13. An apparatus for measuring a blood constituent, comprising:

a plurality of blood constituent value calculators for determining a plurality of possible blood constituent values, each of the possible blood constituent values having a confidence level associated therewith based on at least one quality metric; and

an arbitrator configured to arbitrate between the plurality of possible blood constituent values with regard to the confidence levels to determine a measure of the blood constituent, said arbitrator being further configured to linearly interpolate between the plurality of possible blood constituent values to generate the measure of the blood constituent where none of the confidence levels is greater than all other confidence levels by more than a first amount.

14. An apparatus for measuring a blood constituent using a single data set, comprising:

a plurality of blood constituent value calculators for determining a plurality of possible blood constituent values using, each of the blood constituent value calculators using the single data set, each of the possible blood constituent values having a confidence level associated therewith based on at least one quality metric; and

an arbitrator configured to arbitrate between the plurality of possible blood constituent values with regard to the confidence levels to determine a measure of the blood constituent.

15. An apparatus for determining a patient's pulse rate using signals corresponding to energy transmitted through the tissue of a patient, comprising:

a plurality of pulse rate finders for determining a plurality of possible pulse rates, each of the possible pulse rates having a confidence level associated therewith based on at least one quality metric; and

an arbitrator configured to arbitrate between the plurality of possible pulse rates with regard to the confidence levels to determine the patient's pulse rate, including linearly interpolating between the plurality of possible pulse rates to generate the patient's pulse rate where none of the confidence levels is greater than all other confidence levels by more than a first amount.

16. An apparatus for determining a patient's pulse rate using data corresponding to energy transmitted through the tissue of a patient, comprising:

a plurality of pulse rate finders for determining a plurality of possible pulse rates, each of the possible pulse rates having a confidence level associated therewith based on at least one quality metric; and

an arbitrator configured to arbitrate between the plurality of possible pulse rates with regard to the confidence levels to determine the patient's pulse rate, wherein one pulse rate finder includes

a comb filter to remove signal energy from the data corresponding to a fundamental frequency and harmonics thereof,

a frequency selector for determining a particular harmonic frequency which minimizes noise energy at an output of the comb filter, the particular harmonic frequency corresponding to the fundamental frequency, and

a pulse rate generator for generating the possible pulse rate corresponding to the particular harmonic frequency.

17. The apparatus of claim 16 wherein the frequency selector is further configured to calculate squared noise for the data, calculate a second derivative of the squared noise with respect to the fundamental frequency, and perform a Newton-Raphson search to determine the particular harmonic frequency.

18. The apparatus of claim 16 wherein the frequency selector is further configured to evaluate a power spectrum corresponding to the data to determine which of a plurality of peaks in the power spectrum corresponds to the fundamental frequency, and verify that the particular harmonic frequency corresponds to the fundamental frequency based on said evaluating.

19. The apparatus of claim 16 wherein said plurality of pulse rate finders are configured to select said at least one quality metric from the group consisting of pulse signal

shape, signal-to-noise ratio, correlation of the at least one wavelength of electromagnetic energy, and arrhythmia probability.

20. The apparatus of claim 16 wherein the at least one quality metric comprises a correlation between the data corresponding to two wavelengths of electromagnetic energy.

21. An apparatus for determining a patient's pulse rate using data corresponding to energy transmitted through the tissue of a patient, comprising:

a plurality of pulse rate finders for determining a plurality of possible pulse rates, each of the possible pulse rates having a confidence level associated therewith based on at least one quality metric, wherein one pulse rate finder is configured to determine its corresponding possible pulse rate by comparing the data to a predetermined waveform template, identifying a sequence of waveform characteristics indicative of a waveform period, averaging a number of successive waveform periods to determine an average waveform period, and determining the corresponding possible pulse rate from the average waveform period; and

an arbitrator for arbitrating between the plurality of possible pulse rates with regard to the confidence levels to determine the patient's pulse rate.

22. The apparatus of claim 21 wherein the pulse rate finders are configured to select at least one quality metric from the group consisting of a motion indication and a proportion of motion corrupted pulse periods detected over a time interval.

23. An apparatus for determining a pulse rate of a patient using data corresponding to at least one wavelength of electromagnetic energy transmitted through tissue of the patient, comprising:

an adaptive comb filter configured to track a fundamental frequency to filter the data and to thereby generate a first pulse rate, the first pulse rate having a first confidence level associated therewith based on at least one quality metric;

a comparator configured to compare the data to a predetermined waveform template to generate a second pulse rate, the second pulse rate having a second confidence level associated therewith based on the at least one quality metric; and

an arbitrator configured to arbitrate between the first and second pulse rates with regard to the first and second confidence levels to determine the patient's pulse rate.

24. The apparatus of claim 23 wherein the comb filter is configured to remove signal energy from the data corresponding to the fundamental frequency and harmonics thereof;

and determine a particular harmonic frequency which minimizes noise energy at an output of the comb filter, the particular harmonic frequency corresponding to the fundamental frequency.

25. The apparatus of claim 24 wherein the comb filter is further configured to calculate squared noise for the data, calculate a second derivative of the squared noise with respect to the fundamental frequency, and perform a Newton-Raphson search to determine the fundamental frequency.

26. The apparatus of claim 23 wherein the comb filter is further configured to evaluate a power spectrum corresponding to the data to determine which of a plurality of peaks in the power spectrum corresponds to the fundamental frequency, and verify that the particular harmonic frequency corresponds to the fundamental frequency based on said evaluating.

27. The apparatus of claim 23 wherein the comb filter uses Kalman filtering of the first pulse rate to determine a filtered first pulse rate.

28. The apparatus of claim 23 wherein the comparator is further configured to identify a sequence of waveform characteristics indicative of a waveform period, average a number of successive waveform periods to determine an average waveform period, and determine the second pulse rate from the average waveform period.

29. The apparatus of claim 23 wherein the arbitrator is further configured to compare the first and second confidence levels, and select as the patient's pulse rate one of the first and second confidence levels which is greater than the other of the first and second confidence levels by at least a first amount.

30. The apparatus of claim 23 wherein the arbitrator is further configured to linearly interpolate between the first and second pulse rates to generate the patient's pulse rate where neither of the first and second confidence levels is greater than the other of the first and second confidence levels by more than a first amount.

31. The apparatus of claim 23 further comprising a quality metric generator configured to generate said at least one quality metric from the group consisting of pulse signal shape, signal-to-noise ratio, correlation of the at least one wavelength of electromagnetic energy, and arrhythmia probability.

32. The apparatus of claim 23 wherein there are two wavelengths of electromagnetic energy, and the at least one quality metric corresponding to the first confidence level comprises a correlation between the data corresponding to the two wavelengths.

33. The apparatus of claim 23 wherein the at least one quality metric corresponding to the second confidence level is selected from the group consisting of a motion indication and a proportion of motion corrupted pulse periods detected over a time interval.

34. The apparatus of claim 23 further comprising a preprocessor, wherein said preprocessor comprises:

a logarithmic module for taking the logarithm of a signal representative of the at least one wavelength of electromagnetic energy, thereby generating a first signal;

a band pass filter for band pass filtering the first signal, thereby generating a second signal; and

a normalizer for normalizing the second signal, thereby generating the data;

and wherein the comb filter is configured to take the derivative of the data.